

## ***FY 03 Patents and Inventors***

*TechID:* LIT-PI-436.2                      *Pat #:* 6460402                      *Issue Date:* 10/8/2002  
*Title:*                      **Ultrasonic Fluid Quality Sensor System**

*Abstract:*                      A system for determining the composition of a multiple-component fluid and for determining linear flow comprising at least one sing-around circuit that determines the velocity of a signal in the multiple-component fluid and that is correlatable to a database for the multiple-component fluid. A system for determining flow uses two of the inventive circuits, one of which is set at an angle that is not perpendicular to the direction of flow.

*Inventors:*                      Tyler J Gomm  
                         Nancy C Kraft  
                         Larry D Phelps  
                         Steven C Taylor

*TechID:* LIT-PI-117                      *Pat #:* 6462562                      *Issue Date:* 10/8/2002  
*Title:*                      **Differential Capacitance Probe for Process Control Involving Aqueous Dielectric Fluids**

*Abstract:*                      A differential capacitance probe device for process control involving aqueous dielectric fluids is disclosed. The device contains a pair of matched capacitor probes configured in parallel, one immersed in a sealed container of reference fluid, and the other immersed in the process fluid. The sealed container holding the reference fluid is also immersed in the process fluid, hence both probes are operated at the same temperature. Signal conditioning measures the difference in capacitance between the reference probe and the process probe. The resulting signal is a control error signal that can be used to control the process.

*Inventors:*                      John L Morrison  
                         John M Svoboda

*TechID:* LIT-PI-427                      *Pat #:* 6465706                      *Issue Date:* 10/15/2002  
*Title:*                      **Encapsulation Method for Maintaining Biodecontamination Activity**

*Abstract:*                      : A method for maintaining the viability and subsequent activity of microorganisms utilized in a variety of environments to promote biodecontamination of surfaces. One application involves the decontamination of concrete surfaces. Encapsulation of microbial influenced degradation (MID) microorganisms has shown that MID activity is effectively maintained under passive conditions, that is, without manual addition of moisture or nutrients, for an extended period of time.

*Inventors:*                      Jennifer Benson  
                         Martin L Green  
                         Melinda A Hamilton  
                         Timothy N Milner  
                         Lee O Nelson  
                         Robert D Rogers

*TechID:* LIT-PI-370.2 *Pat #:* 6468445 *Issue Date:* 10/22/2002  
*Title:* Novel Solvent for the Simultaneous Recovery of Radioactive Nuclides from Liquid Radioactive Wastes

*Abstract:* The present invention relates to solvents, and methods, for selectively extracting and recovering radionuclides, especially cesium and strontium, rare earths and actinides from liquid radioactive wastes. More specifically, the invention relates to extracting agent solvent compositions comprising complex organoboron compounds, substituted polyethylene glycols, and neutral organophosphorus compounds in a diluent. The preferred solvent comprises a chlorinated cobalt dicarbollide, diphenyl-dibutylmethylenecarbamoylphosphine oxide, PEG-400, and a diluent of phenylpolyfluoroalkyl sulfone. The invention also provides a method of using the invention extracting agents to recover cesium, strontium, rare earths and actinides from liquid radioactive waste.

*Inventors:* Vasiliy A Babain  
Ken N Brewer  
Valeriy N Romanovskiy  
Igor V Smirnov  
Terry A Todd

*TechID:* LIT-PI-174 *Pat #:* 6473708 *Issue Date:* 10/29/2002  
*Title:* Device and Method for Self-Verifying Temperature Measurement and Control

*Abstract:* A measuring instrument includes a first temperature sensor, a second temperature sensor and circuitry. The first and second temperature sensors each generate a signal indicative of the temperature of a medium being detected. The circuitry is configured to activate verification of temperature being sensed with the first sensor. According to one construction, the first temperature sensor comprises at least one thermocouple temperature sensor and the second temperature sensor comprises an optical temperature sensor, each sensor measuring temperature over the same range of temperature, but using a different physical phenomena. Also according to one construction, the circuitry comprises a computer configured to detect failure of one of the thermocouples by comparing temperature of the optical temperature sensor with each of the thermocouple temperature sensors. Even further, an output control signal is generated via a fuzzy inference machine and control

*Inventors:* Collins P Cannons  
Allen M Porter  
Charles R Tolle  
Arthur D Watkins

*TechID:* B-091 *Pat #:* 6472579 *Issue Date:* 10/29/2002  
*Title:* **Method for Solidification of Radioactive and Other Hazardous Waste**

*Abstract:* Solidification of liquid radioactive waste, and other hazardous wastes, is accomplished by the method of the invention by incorporating the waste into a porous glass crystalline molded block. The porous block is first loaded with the liquid waste and then dehydrated and exposed to thermal treatment at 50-1,000.degree. C. The porous glass crystalline molded block consists of glass crystalline hollow microspheres separated from fly ash (cenospheres), resulting from incineration of fossil plant coals. In a preferred embodiment, the porous glass crystalline blocks are formed from perforated cenospheres of grain size -400+50, wherein the selected cenospheres are consolidated into the porous molded block with a binder, such as liquid silicate glass. The porous blocks are then subjected to repeated cycles of saturating with liquid waste, and drying, and after the last cycle the blocks are subjected to calcination to transform the dried salts to more stable oxides. Radioactive liquid waste can be further stabilized in the porous blocks by coating the internal surface of the block with metal oxides prior to adding the liquid waste, and by coating the outside of the block with a low-melting glass or a ceramic after the waste is loaded into the block.

*Inventors:* Dieter A Knecht  
Troy J Tranter

*TechID:* LIT-PI-445 *Pat #:* 6474903 *Issue Date:* 11/5/2002  
*Title:* **Retractable Barrier Strip**

*Abstract:* A portable barrier strip having retractable tire-puncture spikes for puncturing a vehicle tire. The tire-puncture spikes have an armed position for puncturing a tire and a retracted position for not puncturing a tire. The strip comprises a plurality of barrier blocks having the tire-puncture spikes removably disposed in a shaft that is rotatably disposed in each barrier block. The plurality of barrier blocks are hingedly interconnected by complementary hinges integrally formed into the side of each barrier block which allow the strip to be rolled for easy storage and retrieval, but which prevent irregular or back bending of the strip. The shafts of adjacent barrier blocks are pivotally interconnected via a double hinged universal joint to accommodate irregularities in a roadway surface and to transmit torsional motion of the shaft from block to block. A single flexshaft cable is connected to the shaft of an end block to allow a user to selectively cause the shafts of a plurality of adjacently connected barrier blocks to rotate the tire-puncture spikes to the armed position for puncturing a vehicle tire, and to the retracted position for not puncturing the tire. The flexshaft is provided with a resiliently biased retracting mechanism, and a release latch for allowing the spikes to be quickly retracted after the intended vehicle tire is punctured.

*Inventors:* Stacey G Barker  
Donna J Marts  
Thomas E Vellenoweth  
Andrew Wowczuk

*TechID:* LIT-PI-429 *Pat #:* 6486962 *Issue Date:* 11/26/2002  
*Title:* Method and Apparatus for Assessing Material Properties of Sheet-Like Materials

*Abstract:* Apparatus for producing an indication of a material property of a sheet-like material according to the present invention may comprise an excitation source for vibrating the sheet-like material to produce at least one traveling wave therein. A light source configured to produce an object wavefront and a reference wavefront directs the object wavefront toward the sheet-like material to produce a modulated object wavefront. A modulator operatively associated with the reference wavefront modulates the reference wavefront in synchronization with the traveling wave on the sheet-like material to produce a modulated reference wavefront. A sensing medium positioned to receive the modulated object wavefront and the modulated reference wavefront produces an image of the traveling wave in the sheet-like material, the image of the anti-symmetric traveling wave being related to a displacement amplitude of the anti-symmetric traveling wave over a two-dimensional area of the vibrating sheet-like material. A detector detects the image of the traveling wave in the sheet-like material.

*Inventors:* Vance A Deason  
Kenneth L Telschow

*TechID:* LIT-PI-591 *Pat #:* 6484584 *Issue Date:* 11/26/2002  
*Title:* Method for the Concurrent Ultrasonic Inspection of Partially Completed Welds

*Abstract:* A method for the concurrent ultrasonic inspection of partially completed welds is disclosed and which includes providing a pair of transducers which are individually positioned on the opposite sides of a partially completed weld to be inspected; moving the transducers along the length of and laterally inwardly and outwardly relative to the partially completed weld; pulsing the respective transducers to produce an ultrasonic signal which passes through or is reflected from the partially completed weld; receiving from the respective transducers ultrasonic signals which pass through or are reflected from the partially completed welds; and analyzing the ultrasonic signal which has passed through or is reflected from the partially completed weld to determine the presence of any weld defects.

*Inventors:* John A Johnson  
Eric D Larsen  
Timothy R McJunkin  
Karen S Miller  
Herschel B Smartt

*TechID:* LIT-PI-436                      *Pat #:* 6487916                      *Issue Date:* 12/3/2002  
*Title:*                      **Ultrasonic Flow Metering System**

*Abstract:*                      system for determining the density, flow velocity, and mass flow of a fluid comprising at least one sing-around circuit that determines the velocity of a signal in the fluid and that is correlatable to a database for the fluid. A system for determining flow velocity uses two of the inventive circuits with directional transmitters and receivers, one of which is set at an angle to the direction of flow that is different from the others.

*Inventors:*                      Tyler J Gomm  
                         Nancy C Kraft  
                         Jason A Mauseth  
                         Larry D Phelps  
                         Steven C Taylor

*TechID:* LIT-PI-125A1                      *Pat #:* 6492800                      *Issue Date:* 12/10/2002  
*Title:*                      **Electro-Optic Voltage Sensor with Multiple Beam Splitting**

*Abstract:*                      The invention is a miniature electro-optic voltage sensor system capable of accurate operation at high voltages without use of the dedicated voltage dividing hardware typically found in the prior art. The invention achieves voltage measurement without significant error contributions from neighboring conductors or environmental perturbations. The invention employs a transmitter, a sensor, a detector, and a signal processor. The transmitter produces a beam of electromagnetic radiation which is routed into the sensor. Within the sensor the beam undergoes the Pockels electro-optic effect. The electro-optic effect produces a modulation of the beam's polarization, which is in turn converted to a pair of independent conversely-amplitude-modulated signals, from which the voltage of the E-field is determined by the signal processor. The use of converse AM signals enables the signal processor to better distinguish signal from noise. The sensor converts the beam by splitting the beam in accordance with the axes of the beam's polarization state (an ellipse) into at least two AM signals. These AM signals are fed into a signal processor and processed to determine the voltage between a ground conductor and the conductor on which voltage is being measured.

*Inventors:*                      Thomas M Crawford  
                         James R Davidson  
                         Todd W Renak  
                         Gregory K Woods

*TechID:* LIT-PI-391 *Pat #:* 6495824 *Issue Date:* 12/17/2002  
*Title:* Ion Mobility Spectrometer, Spectrometer Analyte Detection and Identification Verification System, and Method

*Abstract:* Methods and apparatus for ion mobility spectrometry and analyte detection and identification verification system are disclosed. The apparatus is configured to be used in an ion mobility spectrometer and includes a plurality of reactant reservoirs configured to contain a plurality of reactants which can be reacted with the sample to form adducts having varying ion mobilities. A carrier fluid, such as air or nitrogen, is used to carry the sample into the spectrometer. The plurality of reactants are configured to be selectively added to the carrier stream by use inlet and outlet manifolds in communication with the reagent reservoirs, the reservoirs being selectively isolatable by valves. The invention further includes a spectrometer having the reagent system described. In the method, a first reactant is used with the sample. Following a positive result, a second reactant is used to determine whether a predicted response occurs. The occurrence of the second predicted response tends to verify the existence of a component of interest within the sample. A third reactant can also be used to provide further verification of the existence of a component of interest. A library can be established of known responses of compounds of interest with various reactants and the results of a specific multi-reactant survey of a sample can be compared against the library to determine whether a component detected in the sample is likely to be a specific component of interest.

*Inventors:* David A Atkinson

*TechID:* LIT-PI-402A DIV *Pat #:* 6494191 *Issue Date:* 12/17/2002  
*Title:* Systems and Methods for Delivering Liquefied Gas to an Engine

*Abstract:* A liquified gas delivery system for a motorized platform includes a holding tank configured to receive liquified gas. A first conduit extends from a vapor holding portion of the tank to a valve device. A second conduit extends from a liquid holding portion of the tank to the valve device. Fluid coupled to the valve device is a vaporizer which is in communication with an engine. The valve device selectively withdraws either liquified gas or liquified gas vapor from the tank depending on the pressure within the vapor holding portion of the tank. Various configurations of the delivery system can be utilized for pressurizing the tank during operation.

*Inventors:* Dennis N Bingham  
Kevin B Brown  
James E O'Brien  
Ali S Siahpush  
Bruce M Wilding

*TechID:* LIT-PI-344 *Pat #:* 6495204 *Issue Date:* 12/17/2002  
*Title:* Method for Modifying Monofilaments, Bundles of Monofilaments, and High Strength Fibrous Material

*Abstract:* The present invention is related to the modifying of substrates such as monofilaments, bundles of monofilaments, and fibrous structural material with a modifying agent. The modifying agent is suspended or dissolved in a supercritical fluid, near-critical fluid, superheated fluid, superheated liquid, or a liquified gas and is deposited by rapidly altering the pressure in a chamber to deposit the modifying material onto the substrate.

*Inventors:* Charles A Allen  
Mark D Argyle  
Robert V Fox  
Daniel M Ginosar  
Stuart K Janikowski  
David L Miller  
W. Alan Propp  
William J Toth

*TechID:* LIT-PI-419 *Pat #:* 6497153 *Issue Date:* 12/24/2002  
*Title:* Measuring Spatial Variability in Soil Characteristics

*Abstract:* The present invention provides systems and methods for measuring a load force associated with pulling a farm implement through soil that is used to generate a spatially variable map that represents the spatial variability of the physical characteristics of the soil. An instrumented hitch pin configured to measure a load force is provided that measures the load force generated by a farm implement when the farm implement is connected with a tractor and pulled through or across soil. Each time a load force is measured, a global positioning system identifies the location of the measurement. This data is stored and analyzed to generate a spatially variable map of the soil. This map is representative of the physical characteristics of the soil, which are inferred from the magnitude of the load force.

*Inventors:* John R Hess  
J. Richard Hess  
Reed L Hoskinson  
J Wayne Sawyer  
John M Svoboda

*TechID:* B-049 *Pat #:* 6497748 *Issue Date:* 12/24/2002  
*Title:* Method and Apparatus for Removing Non-Condensable Gas from a Working Fluid in a Binary Power System

*Abstract:* Apparatus for removing non-condensable gas from a working fluid utilized in a thermodynamic system comprises a membrane having an upstream side operatively connected to the thermodynamic system so that the upstream side of the membrane receives a portion of the working fluid. The first membrane separates the non-condensable gas from the working fluid. A pump operatively associated with the membrane causes the portion of the working fluid to contact the membrane and to be returned to the thermodynamic system.

*Inventors:* K Kit Bloomfield  
Gregory L Mines  
Charles M Mohr

*TechID:* LIT-PI-199B *Pat #:* 6502467 *Issue Date:* 1/7/2003  
*Title:* Improved System for Measuring Multiphase Flow Using Multiple Pressure Differentials

*Abstract:* An improved method and system for measuring a multi-phase flow in a pressure flow meter. An extended throat venturi is used and pressure of the multi-phase flow is measured at three or more positions in the venturi, which define two or more pressure differentials in the flow conduit. The differential pressures are then used to calculate the mass flow of the gas phase, the total mass flow, and the liquid phase. The system for determining the mass flow of the high void fraction fluid flow and the gas flow includes taking into account a pressure drop experienced by the gas phase due to work performed by the gas phase in accelerating the liquid phase.

*Inventors:* James R Fincke

*TechID:* LIT-PI-500 *Pat #:* 6511601 *Issue Date:* 1/28/2003  
*Title:* Method and System for Extraction of Chemicals From Aquifer Remediation Effluent  
Water

*Abstract:* A method and system for extraction of chemicals from an groundwater remediation aqueous effluent are provided. The extraction method utilizes a critical fluid for separation and recovery of chemicals employed in remediating groundwater contaminated with hazardous organic substances, and is particularly suited for separation and recovery of organic contaminants and process chemicals used in surfactant-based remediation technologies. The extraction method separates and recovers high-value chemicals from the remediation effluent and minimizes the volume of generated hazardous waste. The recovered chemicals can be recycled to the remediation process or stored for later use.

*Inventors:* Donna L Barker  
Daniel M Ginosar  
Ryan D McMurtrey  
Kenneth S Moor  
G. Michael Shook

*TechID:* B-030 *Pat #:* 6514566 *Issue Date:* 2/4/2003  
*Title:* Ion Processing Element with Composite Media

*Abstract:* An ion processing element employing composite media disposed in a porous substrate, for facilitating removal of selected chemical species from a fluid stream. The ion processing element includes a porous fibrous glass substrate impregnated by composite media having one or more active components supported by a matrix material of polyacrylonitrile. The active components are effective in removing, by various mechanisms, one or more constituents from a fluid stream passing through the ion processing element. Due to the porosity and large surface area of both the composite medium and the substrate in which it is disposed, a high degree of contact is achieved between the active component and the fluid stream being processed. Further, the porosity of the matrix material and the substrate facilitates use of the ion processing element in high volume applications where it is desired to effectively process a high volume flows.

*Inventors:* Nick R Mann  
Ferdinand Sebesta  
Terry A Todd  
Troy J Tranter

*TechID:* B-033 *Pat #:* 6539780 *Issue Date:* 4/1/2003  
*Title:* Self-Compensating Tensiometer and Method

*Abstract:* A pressure self-compensating tensiometer and method to in situ determine below grade soil moisture potential of earthen soil independent of changes in the volume of water contained within the tensiometer chamber, comprising a body having first and second ends, a porous material defining the first body end, a liquid within the body, a transducer housing submerged in the liquid such that a transducer sensor within the housing is kept below the working fluid level in the tensiometer and in fluid contact with the liquid and the ambient atmosphere.

*Inventors:* Joel M Hubbell  
James B Sisson

*TechID:* LIT-PI-570 *Pat #:* 6544690 *Issue Date:* 4/8/2003  
*Title:* Self-Doped Molecular Composite Battery Electrolytes

*Abstract:* This invention is in solid polymer-based electrolytes for battery applications. It uses molecular composite technology, coupled with unique preparation techniques to render a self-doped, stabilized electrolyte material suitable for inclusion in both primary and secondary batteries. In particular, a salt is incorporated in a nano-composite material formed by the in situ catalyzed condensation of a ceramic precursor in the presence of a solvated polymer material, utilizing a condensation agent comprised of at least one cation amenable to SPE applications. As such, the counterion in the condensation agent used in the formation of the molecular composite is already present as the electrolyte matrix develops. This procedure effectively decouples the cation loading levels required for maximum ionic conductivity from electrolyte physical properties associated with condensation agent loading levels by utilizing the inverse relationship discovered between condensation agent loading and the time domain of the aging step.

*Inventors:* Mason K Harrup  
Frederick F Stewart  
Alan K Wertsching

*TechID:* LIT-PI-199B1 *Pat #:* 6546811 *Issue Date:* 4/15/2003  
*Title:* Multiphase Flow Calculation Software

*Abstract:* Multiphase flow calculation software and computer-readable media carrying computer executable instructions for calculating liquid and gas phase mass flow rates of high void fraction multiphase flows. The multiphase flow calculation software employs various given, or experimentally determined, parameters in conjunction with a plurality of pressure differentials of a multiphase flow, preferably supplied by a differential pressure flowmeter or the like, to determine liquid and gas phase mass flow rates of the high void fraction multiphase flows. Embodiments of the multiphase flow calculation software are suitable for use in a variety of applications, including real-time management and control

*Inventors:* James R Fincke

*TechID:* B-036A *Pat #:* 6551385 *Issue Date:* 4/22/2003  
*Title:* Two Stroke Engine Exhaust Emissions Separator

*Abstract:* A separator for substantially resolving at least one component of a process stream, such as from the exhaust of an internal combustion engine. The separator includes a body defining a chamber therein. A nozzle housing is located proximate the chamber. An exhaust inlet is in communication with the nozzle housing and the chamber. A nozzle assembly is positioned in the nozzle housing and includes a nozzle moveable within and relative to the nozzle housing. The nozzle includes at least one passage formed therethrough such that a process stream entering the exhaust inlet connection passes through the passage formed in the nozzle and imparts a substantially rotational flow to the process stream as it enters the chamber. A positioning member is configured to position the nozzle relative to the nozzle housing in response to changes in process stream pressure thereby adjusting flowrate of said process stream entering into the chamber.

*Inventors:* Michael G McKellar  
Kevin T Raterman  
Terry D Turner  
Bruce M Wilding

*TechID:* LIT-PI-125 *Pat #:* 2239722 *Issue Date:* 4/29/2003  
*Title:* Electro Optic Voltage Sensor

*Abstract:* A miniature electro-optic voltage sensor system capable of accurate operation at high voltages. The system employs a transmitter, a sensor disposed adjacent to but out of direct electrical contact with a conductor on which the voltage is to be measured, a detector, and a signal processor. The transmitter produces a beam of electromagnetic radiation which is routed into the sensor where the beam undergoes the Pockels electro-optic effect. The electro-optic effect causes phase shifting in the beam, which is in turn converted to a pair of independent beams, from which the voltage of a system based on its E-field is determined when the two beams are normalized by the signal processor. The sensor converts the beam by splitting the beam in accordance with the axes of the beam's polarization state (an ellipse whose ellipticity varies between -1 and +1 in proportion to voltage) into at least two AM signals. These AM signals are fed into a signal processor and processed to determine the voltage between a ground conductor and the conductor on which voltage is being measured.

*Inventors:* Todd W Renak  
Gregory K Woods

*TechID:* LIT-PI-410 *Pat #:* 6563303 *Issue Date:* 5/13/2003  
*Title:* Methods and Computer Executable Instructions for Marking a  
Downhole Elongate Line and Detecting Same

*Abstract:* Methods and computer executable instructions are provided for making an elongate line (22) with a plurality of marks (30) and detecting those marks (30) to determine a distance of the elongate line (22) in a downhole or a physical integrity thereof. In a preferred embodiment, each mark comprises a plurality of particles (44) having a substantially permanent magnetizing capability adhered to an exterior surface of the elongate line (22) at preselected intervals with an epoxy paint. The particles (44) are arranged at each interval as a plurality of bands (40). Thereafter, the particles are oriented into a magnetic signature for that interval by magnetizing the particles to create a magnetic field substantially normal to the exterior surface. This facilitates detection by a Hall effect probe. The magnetic signatures are stored in a computing configuration and, once a mark is detected, a correlation is made to a unique position on the elongate line by comparison with the stored magnetic signatures. Preferred particles include samarium-cobalt and neodymium-iron-boride.

*Inventors:* Arthur D Watkins

*TechID:* LIT-PI-241 *Pat #:* 6576449 *Issue Date:* 6/10/2003  
*Title:* Microbial Production of Epoxides

*Abstract:* A method for microbial production of epoxides and other oxygenated products is disclosed. The method uses a biocatalyst of methanotrophic bacteria cultured in a biphasic medium containing a major amount of a non-aqueous polar solvent. Regeneration of reducing equivalents is carried out by using endogenous hydrogenase activity together with supplied hydrogen gas. This method is especially effective with gaseous substrates and cofactors that result in liquid products.

*Inventors:* Thomas R Clark  
Francisco F Roberto

*TechID:* LIT-PI-506 *Pat #:* 6575663 *Issue Date:* 6/10/2003  
*Title:* Advanced Containment System

*Abstract:* A containment system to isolate waste in the ground including parallel interlocking tubes.

*Inventors:* Hideki Kawamura  
Kevin M Kostelnik  
Masaru Noda

*TechID:* LIT-PI-470 *Pat #:* 6576335 *Issue Date:* 6/10/2003  
*Title:* Solid-Phase Materials for Chelating Metal Ions and Methods of Making and Using Same

*Abstract:* A solid material for recovering metal ions from aqueous streams, and methods of making and using the solid material, are disclosed. The solid material is made by covalently bonding a chelating agent to a silica-based solid, or in-situ condensing ceramic precursors along with the chelating agent to accomplish the covalent bonding. The chelating agent preferably comprises an oxime type chelating head, preferably a salicylaldoxime-type molecule, with an organic tail covalently bonded to the head. The hydrocarbon tail includes a carbon-carbon double bond, which is instrumental in the step of covalently bonding the tail to the silica-based solid or the in-situ condensation. The invented solid material may be contacted directly with aqueous streams containing metal ions, and is selective to ions such as copper (II) even in the presence of such ions as iron (III) and other materials that are present in earthen materials. The solid material with high selectivity to copper may be used to recover copper from mining and plating industry streams, to replace the costly and toxic solvent extraction steps of conventional copper processing.

*Inventors:* Mason K Harrup  
Eric S Peterson  
John E Wey

*TechID:* LIT-PI-597 *Pat #:* 6579821 *Issue Date:* 6/17/2003  
*Title:* Method and Reactivating Solid Catalysts Used in Alkylation Reactions

*Abstract:* A method for reactivating a solid alkylation catalyst is provided which can be performed within a reactor that contains the alkylation catalyst or outside the reactor. Effective catalyst reactivation is achieved whether the catalyst is completely deactivated or partially deactivated. A fluid reactivating agent is employed to dissolve catalyst fouling agents and also to react with such agents and carry away the reaction products. The deactivated catalyst is contacted with the fluid reactivating agent under pressure and temperature conditions such that the fluid reactivating agent is dense enough to effectively dissolve the fouling agents and any reaction products of the fouling agents and the reactivating agent. Useful pressures and temperatures for reactivation include near-critical, critical, and supercritical pressures and temperatures for the reactivating agent. The fluid reactivating agent can include, for example, a branched paraffin containing at least one tertiary carbon atom, or a compound that can be isomerized to a molecule containing at least one tertiary carbon atom.

*Inventors:* Kyle C Burch  
Robert V Fox  
Daniel M Ginosar  
David N Thompson  
David J Zalewski

*TechID:* B-156 *Pat #:* 6581409 *Issue Date:* 6/24/2003  
*Title:* Apparatus for the Liquefaction of Natural Gas and Methods Related to Same

*Abstract:* An apparatus and method for producing liquefied natural gas. A liquefaction plant may be coupled to a source of unpurified natural gas, such as a natural gas pipeline at a pressure letdown station. A portion of the gas is drawn off and split into a process stream and a cooling stream. The cooling stream passes through a turbo expander creating work output. A compressor is driven by the work output and compresses the process stream. The compressed process stream is cooled, such as by the expanded cooling stream. The cooled, compressed process stream is divided into first and second portions with the first portion being expanded to liquefy the natural gas. A gas-liquid separator separates the vapor from the liquid natural gas. The second portion of the cooled, compressed process stream is also expanded and used to cool the compressed process stream. Additional features and techniques may be integrated with the liquefaction process including a water clean-up cycle and a carbon dioxide (CO.sub.2) clean-up cycle.

*Inventors:* Dennis N Bingham  
Kerry M Klingler  
Michael G McKellar  
Gary L Palmer  
Kevin T Raterman  
Terry D Turner  
John Vranicar  
Bruce M Wilding

*TechID:* LIT-PI-337 *Pat #:* 6591145 *Issue Date:* 7/8/2003  
*Title:* Systems and Methods for Autonomously Controlling Agricultural Machinery

*Abstract:* Systems and methods for autonomously controlling agricultural machinery such as a grain combine. The operation components of a combine that function to harvest the grain have characteristics that are measured by sensors. For example, the combine speed, the fan speed, and the like can be measured. An important sensor is the grain loss sensor, which may be used to quantify the amount of grain expelled out of the combine. The grain loss sensor utilizes the fluorescence properties of the grain kernels and the plant residue to identify when the expelled plant material contains grain kernels. The sensor data, in combination with historical and current data stored in a database, is used to identify optimum operating conditions that will result in increased crop yield. After the optimum operating conditions are identified, an on-board computer can generate control signals that will adjust the operation of the components identified in the optimum operating conditions. The changes result in less grain loss and improved grain yield. Also, because new data is continually generated by the sensor, the system has the ability to continually learn such that the efficiency of the agricultural machinery is continually improved.

*Inventors:* Dennis N Bingham  
J. Richard Hess  
Reed L Hoskinson  
John M Svoboda

*TechID:* LIT-PI-593 *Pat #:* 6599369 *Issue Date:* 7/29/2003

*Title:* Method of Treating Contaminated HEPA Filter Media in Pulp Process

*Abstract:* A method for reducing contamination of HEPA filters with radioactive and/or hazardous materials is described. The method includes pre-processing of the filter for removing loose particles. Next, the filter medium is removed from the housing, and the housing is decontaminated. Finally, the filter medium is processed as pulp for removing contaminated particles by physical and/or chemical methods, including gravity, flotation, and dissolution of the particles. The decontaminated filter medium is then disposed of as non-RCRA waste; the particles are collected, stabilized, and disposed of according to well known methods of handling such materials; and the liquid medium in which the pulp was processed is recycled.

*Inventors:* Mark D Argyle  
Rick L Demmer  
Jian S Hu  
Emilio P Mondok

*TechID:* LIT-PI-188 *Pat #:* 6602418 *Issue Date:* 8/5/2003

*Title:* Solution Dewatering with Concomitant Ion Removal

*Abstract:* One of the biggest needs in the separations and waste handling and reduction area is a method for dewatering ion-containing solutions. Unexpectedly, it has been found that phosphazene polymers can discriminate between water and metal ions, allowing water to pass through the membrane while retaining the ions. This unexpected result, along with the inherent chemical and thermal stability of the phosphazene polymers, yields a powerful tool for separating and dewatering metal-ion-containing solutions.

*Inventors:* Douglas W Marshall  
Eric S Peterson  
Mark L Stone

*TechID:* LIT-PI-579 *Pat #:* 6606855 *Issue Date:* 8/19/2003

*Title:* Plasma Reforming and Partial Oxidation of Hydrocarbon Fuel Vapor to Produce Synthesis Gas and/or Hydrogen Gas

*Abstract:* Methods and systems for treating vapors from fuels such as gasoline or diesel fuel in an internal combustion engine, to form hydrogen gas or synthesis gas, which can then be burned in the engine to produce more power. Fuel vapor, or a mixture of fuel vapor and exhaust gas and/or air, is contacted with a plasma, to promote reforming reactions between the fuel vapor and exhaust gas to produce carbon monoxide and hydrogen gas, partial oxidation reactions between the fuel vapor and air to produce carbon monoxide and hydrogen gas, or direct hydrogen and carbon particle production from the fuel vapor. The plasma can be a thermal plasma or a non-thermal plasma. The plasma can be produced in a plasma generating device which can be preheated by contact with at least a portion of the hot exhaust gas stream, thereby decreasing the power requirements of the plasma generating device.

*Inventors:* Brent A Detering  
Peter C Kong

*Abstract:* A method of retrieving a liquid sample comprises providing a portable lysimeter including a semi-permeable membrane and a chamber in fluid communication with the semi-permeable membrane; making a hole at a site from which a liquid sample is desired; evacuating the chamber by applying a vacuum to the chamber; lowering the portable lysimeter into the hole; obtaining a sample in the chamber; and retrieving the lysimeter from the bore; wherein it is not necessary to backfill the bore. A portable lysimeter includes a semi-permeable member and a chamber in fluid communication with the semi-permeable membrane.

*Inventors:* Joel M Hubbell  
James B Sisson

**Abstract:** A small sized electro-optic voltage sensor capable of accurate measurement of high voltages without contact with a conductor or voltage source is provided. When placed in the presence of an electric field, the sensor receives an input beam of electromagnetic radiation. A polarization beam displacer separates the input beam into two beams with orthogonal linear polarizations and causes one linearly polarized beam to impinge a crystal at a desired angle independent of temperature. The Pockels effect elliptically polarizes the beam as it travels through the crystal. A reflector redirects the beam back through the crystal and the beam displacer. On the return path, the polarization beam displacer separates the elliptically polarized beam into two output beams of orthogonal linear polarization. The system may include a detector for converting the output beams into electrical signals and a signal processor for determining the voltage based on an analysis of the output beams.

**Inventors:** James R Davidson  
Gary D Seifert

*TechID:* LIT-PI-402A.DC. *Pat #:* 6619273 *Issue Date:* 9/16/2003  
*Title:* Systems and Methods for Delivering Liquefied Natural Gas to an Engine

*Abstract:* A liquified gas delivery system for a motorized platform includes a holding tank configured to receive liquified gas. A first conduit extends from a vapor holding portion of the tank to a valve device. A second conduit extends from a liquid holding portion of the tank to the valve device. Fluid coupled to the valve device is a vaporizer which is in communication with an engine. The valve device selectively withdraws either liquified gas or liquified gas vapor from the tank depending on the pressure within the vapor holding portion of the tank. Various configurations of the delivery system can be utilized for pressurizing the tank during operation.

*Inventors:* Dennis N Bingham  
Kevin B Brown  
James E O'Brien  
Ali S Siahpush  
Bruce M Wilding

*TechID:* LIT-PI-199A1 *Pat #:* 6622574 *Issue Date:* 9/23/2003  
*Title:* Oil Field Management System

*Abstract:* Oil field management systems and methods for managing operation of one or more wells producing a high void fraction multiphase flow. The system includes a differential pressure flow meter which samples pressure readings at various points of interest throughout the system and uses pressure differentials derived from the pressure readings to determine gas and liquid phase mass flow rates of the high void fraction multiphase flow. One or both of the gas and liquid phase mass flow rates are then compared with predetermined criteria. In the event such mass flow rates satisfy the predetermined criteria, a well control system implements a correlating adjustment action respecting the multiphase flow. In this way, various parameters regarding the high void fraction multiphase flow are used as control inputs to the well control system and thus facilitate management of well operations.

*Inventors:* James R Fincke

*TechID:* LIT-PI-344.3 *Pat #:* 6623686 *Issue Date:* 9/23/2003

*Title:* System Configured for Applying a Modifying Agent to a  
Non-Equidimensional Substrate

*Abstract:* The present invention is related to systems and methods for modifying various non-equidimensional substrates with modifying agents. The system comprises a processing chamber configured for passing the non-equidimensional substrate therethrough, wherein the processing chamber is further configured to accept a treatment mixture into the chamber during movement of the non-equidimensional substrate through the processing chamber. The treatment mixture can comprise of the modifying agent in a carrier medium, wherein the carrier medium is selected from the group consisting of a supercritical fluid, a near-critical fluid, a superheated fluid, a superheated liquid, and a liquefied gas. Thus, the modifying agent can be applied to the non-equidimensional substrate upon contact between the treatment mixture and the non-equidimensional substrate.

*Inventors:* Charles A Allen  
Mark D Argyle  
Robert V Fox  
Daniel M Ginosar  
Stuart K Janikowski  
David L Miller  
W. Alan Propp  
William J Toth

*TechID:* LIT-PI-529 *Pat #:* 6627197 *Issue Date:* 9/30/2003

*Title:* Selective Destruction of Cells Infected with Human Immunodeficiency Virus

*Abstract:* Compositions and methods for selectively killing a cell containing a viral protease are disclosed. The composition is a variant of a protein synthesis inactivating toxin wherein a viral protease cleavage site is interposed between the A and B chains. The variant of the type II ribosome-inactivating protein is activated by digestion of the viral protease cleavage site by the specific viral protease. The activated ribosome-inactivating protein then kills the cell by inactivating cellular ribosomes. A preferred embodiment of the invention is specific for human immunodeficiency virus (HIV) and uses ricin as the ribosome-inactivating protein. In another preferred embodiment of the invention, the variant of the ribosome-inactivating protein is modified by attachment of one or more hydrophobic agents. The hydrophobic agent facilitates entry of the variant of the ribosome-inactivating protein into cells and can lead to incorporation of the ribosome-inactivating protein into viral particles. Still another preferred embodiment of the invention includes a targeting moiety attached to the variants of the ribosome-inactivating protein to target the agent to HIV infectable cells.

*Inventors:* William K Keener  
Thomas E Ward